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Knee Internal Derangement in a 19-Year-Old Collegiate Football Player: A Case Study

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Abstract

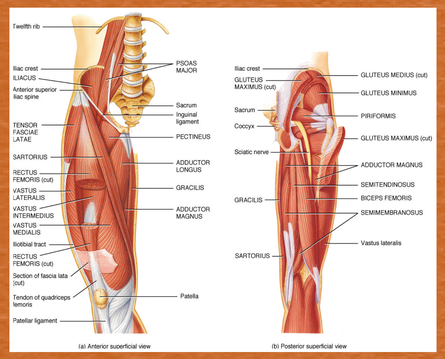
Epidemiologic research illustrates that knee internal derangement is one of the most common injuries in football that requires extensive rehabilitation, with knee injuries consisting of 16.4% of all football related injuries in the NCAA. Knee internal derangement can present in a variety of football positions and is correlated with multiple mechanisms of injury. The Hope College Athletic Training Staff managed a case of Knee internal derangement due to a hyperextension mechanism in a 19 year old collegiate football linebacker. The anatomical structures involved in this incident include the PCL, MCL, medial and lateral menisci, tibial plateau, and femoral condyles. There is very little research on cases this complex, however through an understanding of knee anatomy we will be able to discuss the details regarding injury evaluation, treatment, and rehabilitation. Further, the case highlights the role of athletic trainers in diagnosis, how to properly triage care, and the body's ability to heal naturally by primary intention.

What is Knee Internal Derangement (KID)?

KID is a mechanical disorder of the knee that is due to a torn, ruptured, or deranged meniscus, or a partial or complete cruciate ligament rupture, with potential for synovial capsule involvement. Typical symptoms include pain, instability, and abnormal movement patterns.

Anatomy

The knee consists of the following anatomical structures…



MUSCLE/TENDON

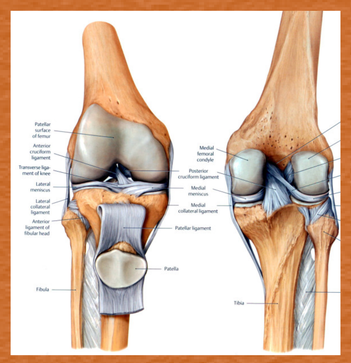
- Sartorius
- Rectus Femoris
- Vastus Lateralis, Medialis, and Intermedius
- Biceps Femoris
- Semitendinosus
- Semimembranosus
- Popilteus
- Gastrocnemeus
- Plantaris
- Gracilis

LIGAMENTOUS /CARTILAGINOUS

- Anterior Cruciate
- Posterior Cruciate
- Lateral Collateral
- Medial Collateral
- Lateral and Medial Menisci

BONE

- Tibia
- Femur
- Fibula
- Patella



Hyperextension Mechanism of Injury

VARIATIONS

- Pure Hyperextension
- Hyperextension with valgus force
- Hyperextension with varus force

- Direct vs. Indirect Trauma

Main Restraints and Knee Stabilizers

ANTERIOR

- Quadriceps Musculature
- Patella/Patellar Tendon

POSTERIOR

- Posterior Synovial Capsule
- Gastrocnemeus
- Posterior Cruciate

MEDIAL

- Superficial and Deep Medial Collateral
- Medial Synovial Capsule
- Medial Retinaculum

LATERAL

- Iliotibial Band
- Biceps Femoris
- Lateral Retinaculum
- Lateral Collateral
- Lateral Joint Capsule

POSTEROMEDIAL

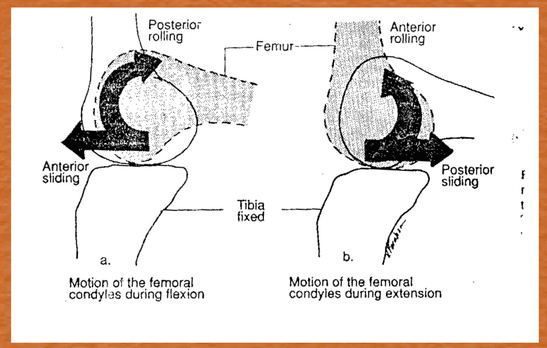
- Semimembranosus
- Semitendinosus
- Posterolateral Corner
- Posterior Oblique Ligament

POSTEROLATERAL

- Popliteus
- Arcuate Ligament

Arthrokinematics vs. Osteokinematics

Rolling, Gliding, Spinning vs. Flexion and Extension



Case Specifics

PRESENTATION

- Athlete described a MOI in which his knee was forced into hyperextension after disengaging from a block on a kickoff return.
- Able to walk off under own power, but complains of swelling, stiffness, and pain described as inside the knee.
- Ligamentous stress testing suggests possible PCL attenuation/tear, ACL sprain, and meniscal involvement.

DIAGNOSTIC IMAGING

X-Ray—No evidence of fracture or dislocation, small suprapatellar efusion
MRI—PCL partial thickness tear near femoral attachment
—Grade-I MCL sprain
—Tear of posterior horn of medial meniscus
—Possible tear of anterior horn of lateral meniscus
—Bone contusion to femoral condyles
—Non-displaced, compression fracture of lateral tibial plateau
—Traumatic synovitis

SURGERY/POST-SURGICAL

- All structures healed by primary intention after 6 week period to allow lateral tibial plateau fracture to heal

- Functional progression to allow for RTP (Wolff's Law)
- Focus on Quadriceps muscle group to limit stress on PCL
- Establish strong core to aid with center of gravity and base of support training
- Multi-dimensional

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